

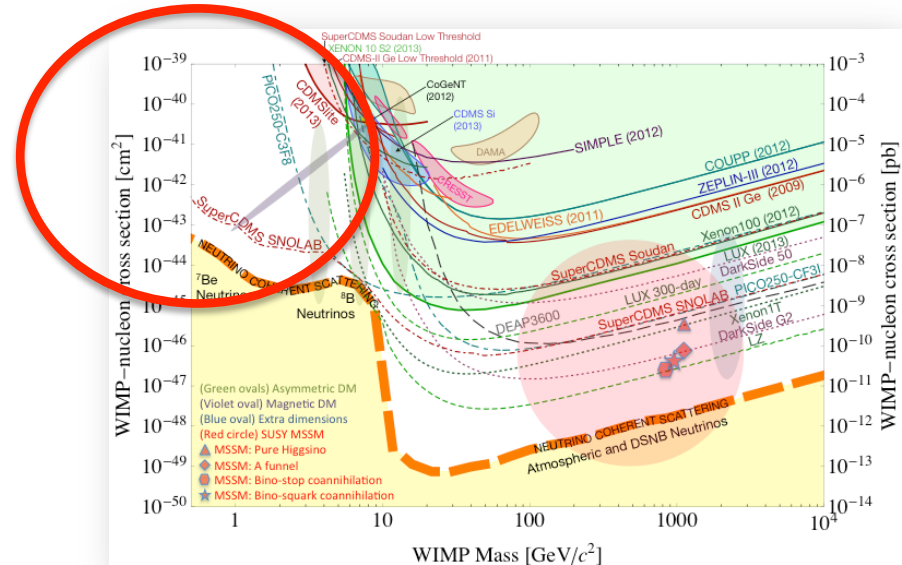
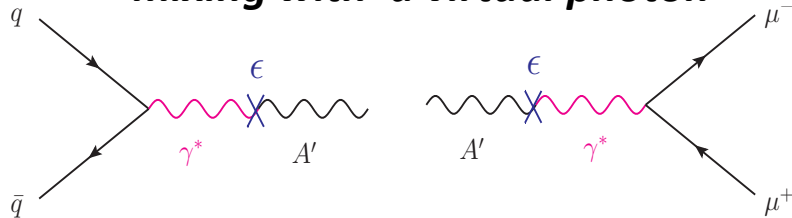
***Highlight on trigger upgrade for dark photon search  
at SeaQuest (Fermi lab)***

Sanghoon Lim  
HENP team in P-25

# Physics of Dark Matter @ SeaQuest

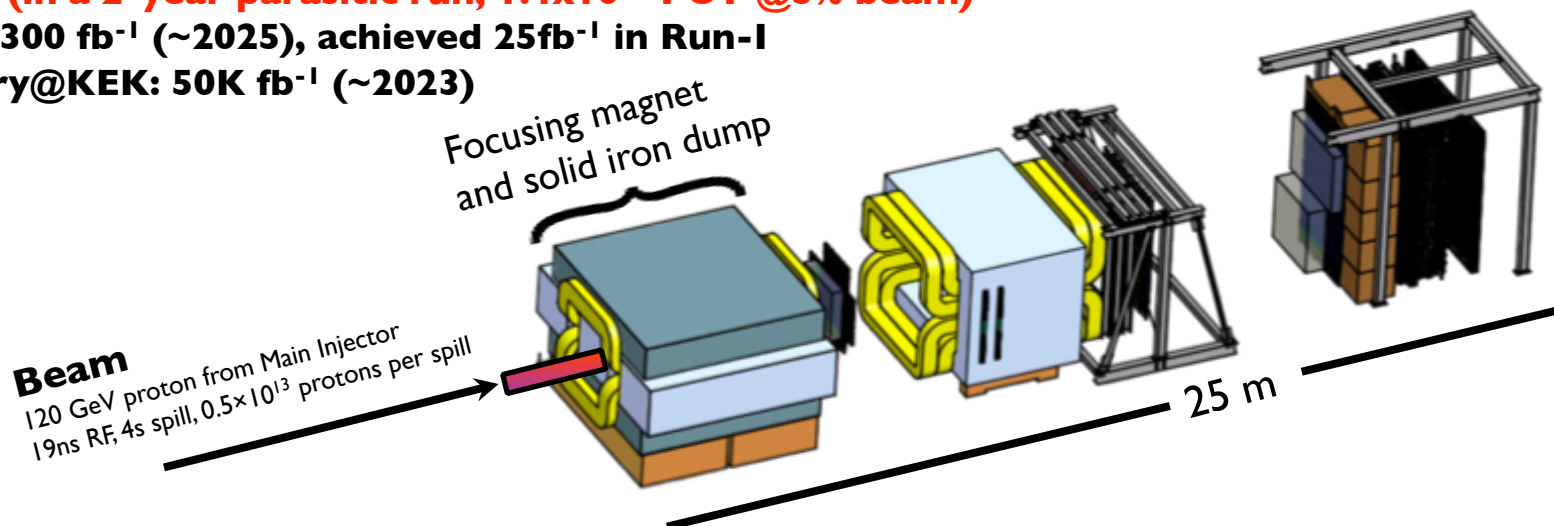
- Current and near future high-intensity collider and fixed target experiment offer an ideal environment to probe **dark sector physics in MeV~GeV**

**Dark photon produced via kinematic mixing with a virtual photon**



**High intensity proton beam: “beam dump mode (p+Fe)” @SeaQuest/EI067**

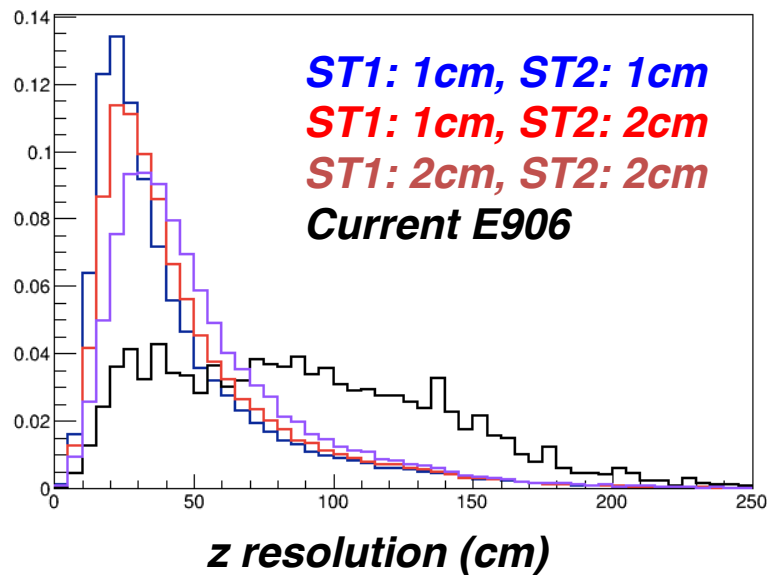
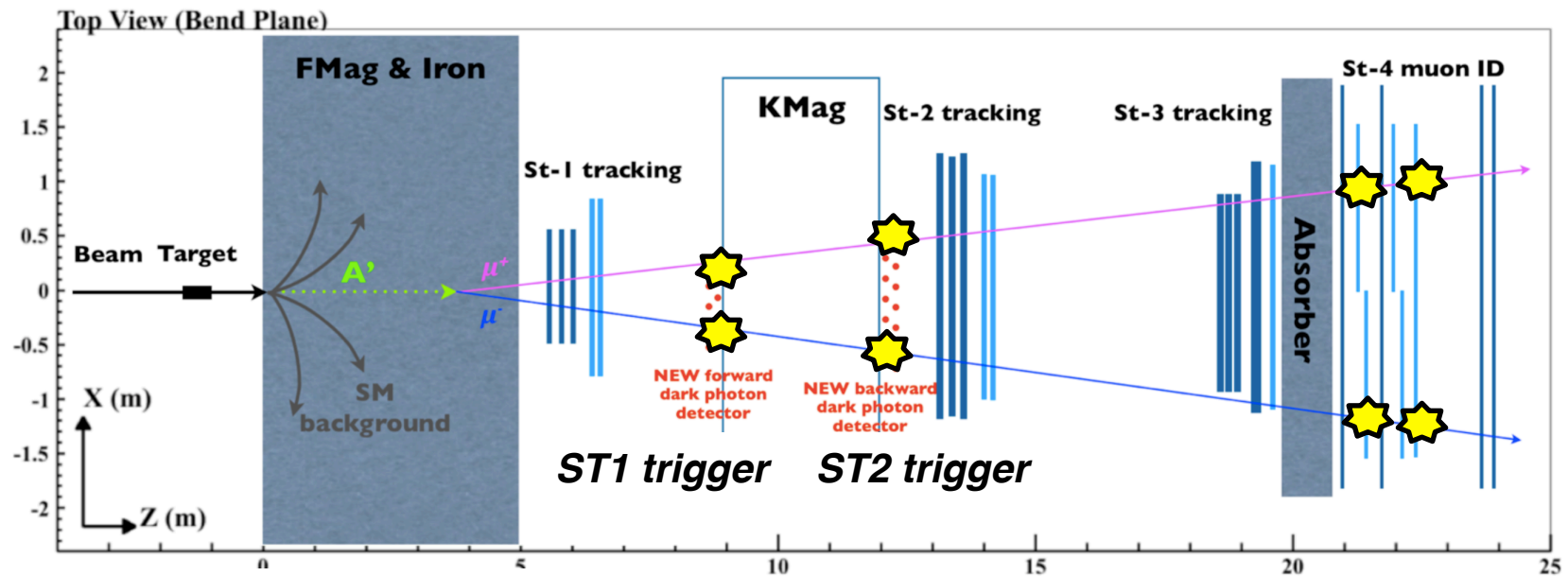
- 35K fb<sup>-1</sup> (in a 2-year parasitic run, 1.4x10<sup>18</sup> POT @5% beam)**
- LHC-II: 300 fb<sup>-1</sup> (~2025), achieved 25fb<sup>-1</sup> in Run-I**
- B-factory@KEK: 50K fb<sup>-1</sup> (~2023)**





# Trigger upgrade for Dark Photon Search

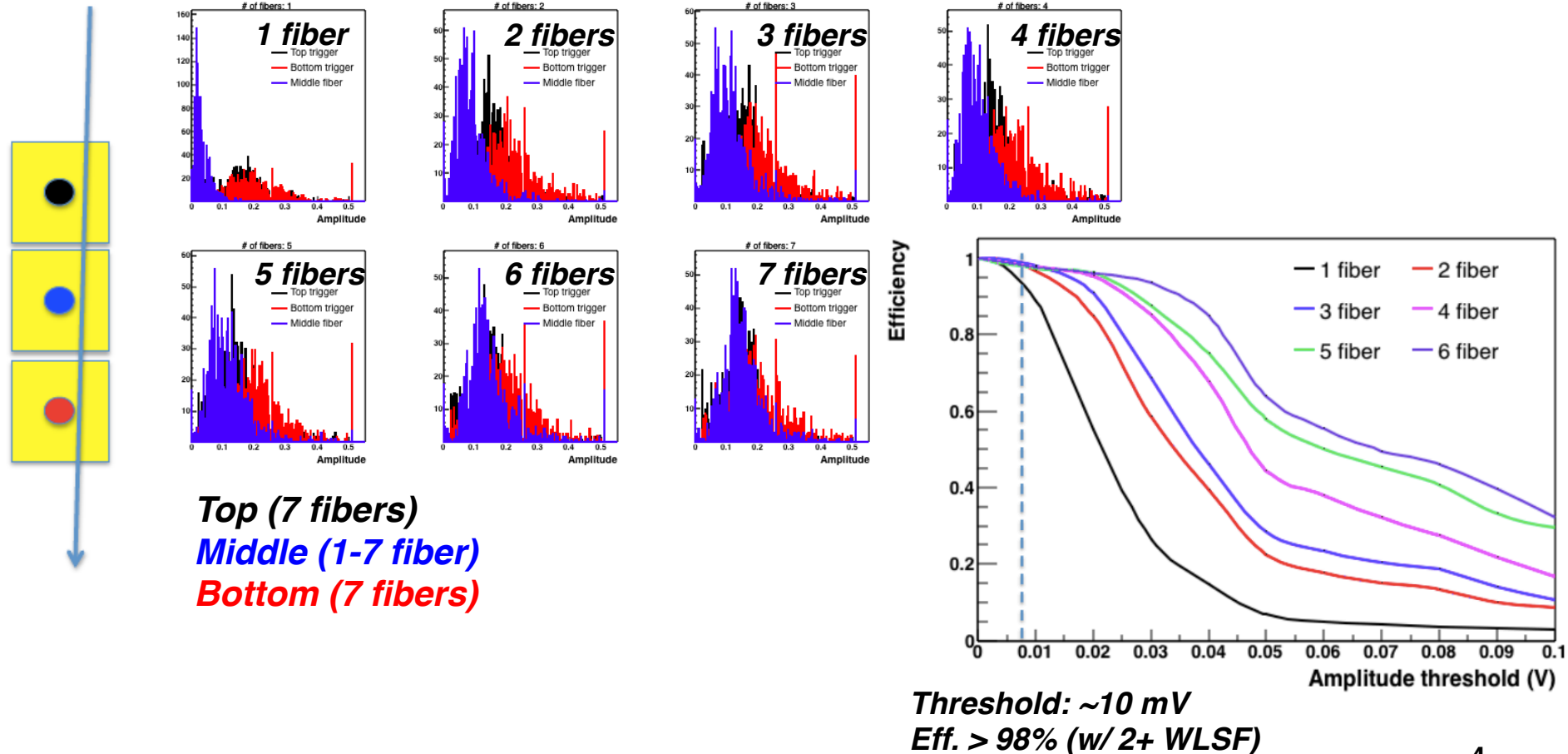
- Trigger for dimuons of large displaced decay vertex



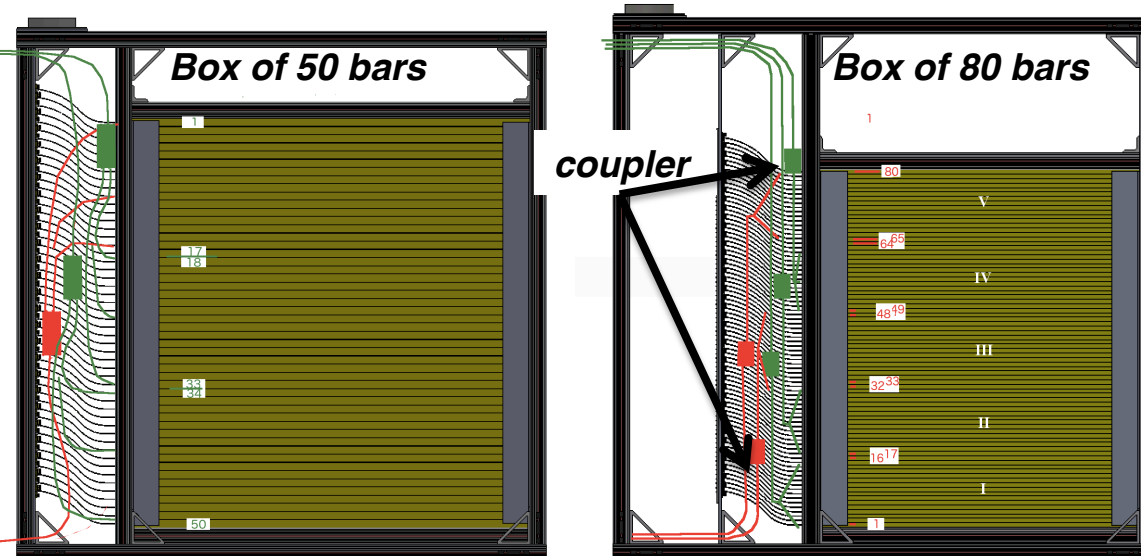
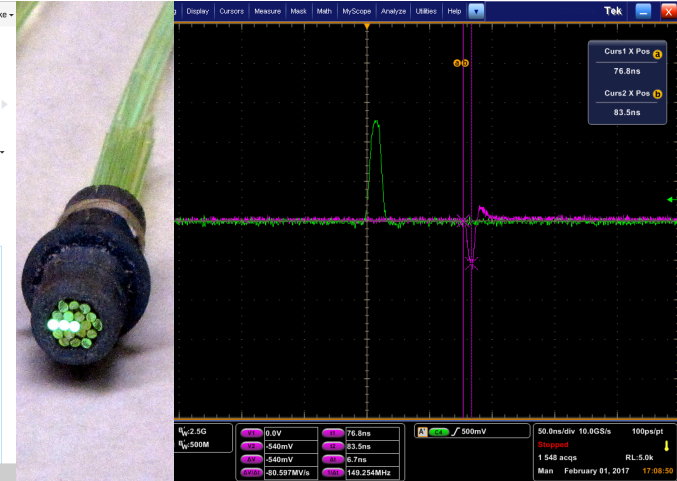
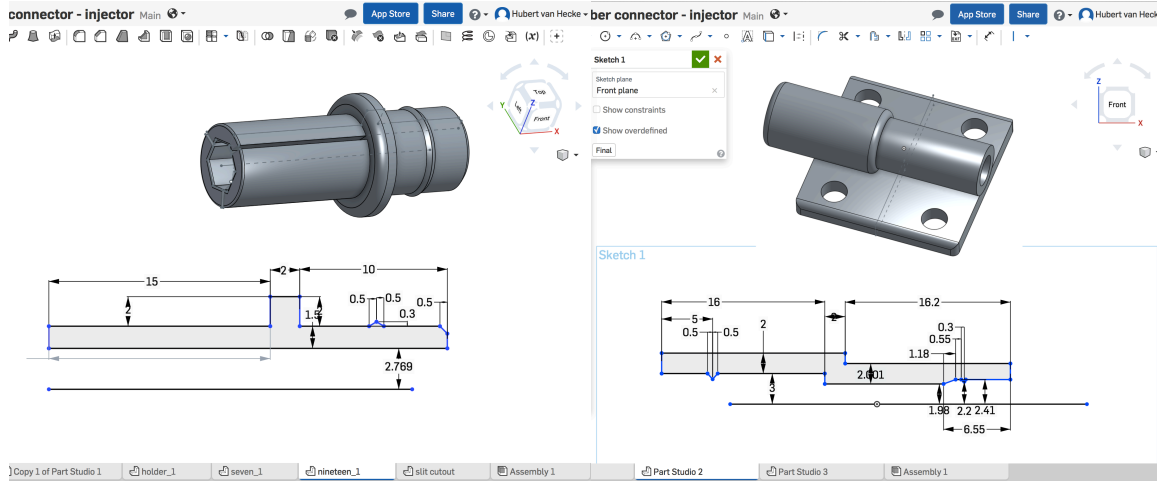
**Largely improved z-resolution  
with trigger station**

# Efficiency study with cosmic

- **Efficiency study**
  - Number of fibers in bar
  - Threshold cut
  - Bias voltage
- **Check cross talk between scintillator bars ( $< 3\%$ )**



- **Calibration system to check efficiency (on/off of each channel)**
  - Use pulser board (red LED) as input
  - Distribute to 19 clear fibers



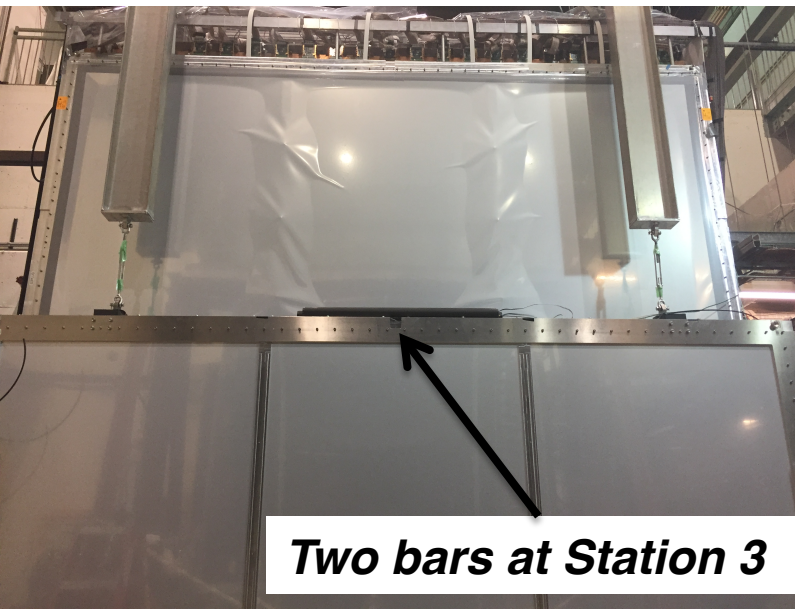
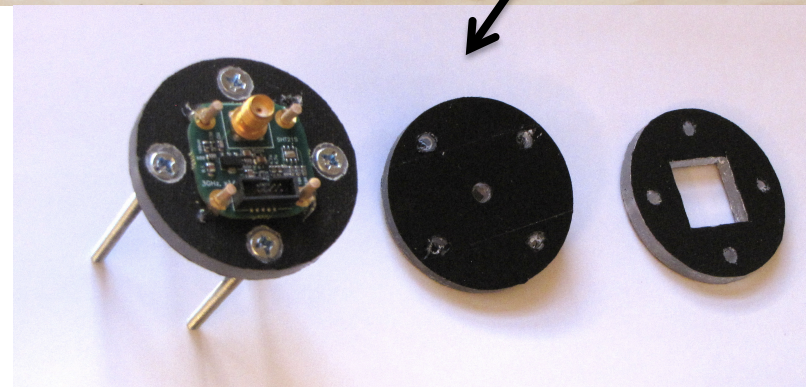
**3 (5) input fibers to coupler  
in 50 (80) bars box**

# Single bar test in E906



- **Single bar module test in E906**

- Performance with beam
- Timing with other systems



**Two bars at Station 3**



**Integrated pulse during one spill  
(a few seconds of collisions)**



# ***Detector integration (Frame)***

- ***Two types of station (Aluminum frame)***
  - Station1: 4 boxes of 80 bars ( $1 \times 1 \times 80 \text{ cm}^3$ )
  - Station2: 4 boxes of 50 bars ( $1.5 \times 1.8 \times 100 \text{ cm}^3$ )

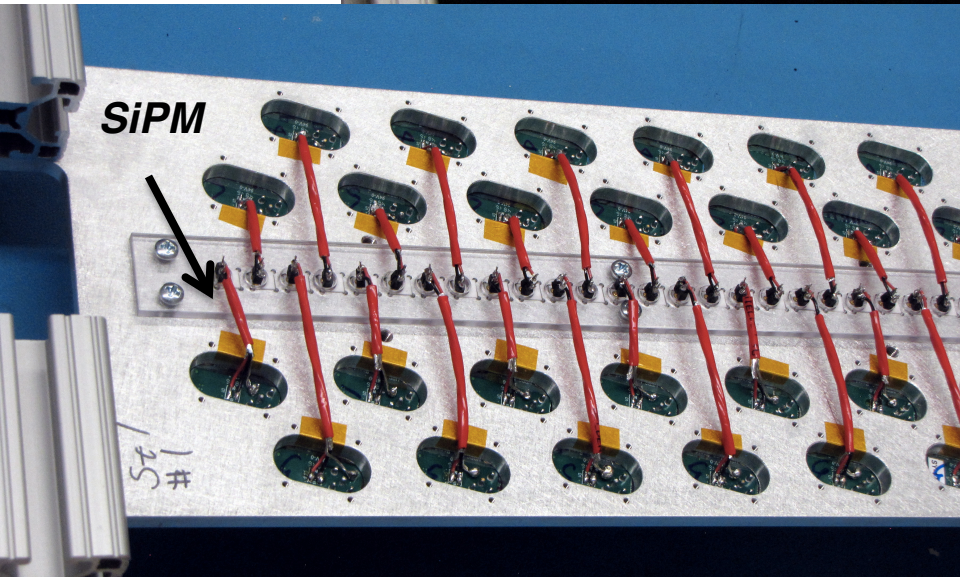
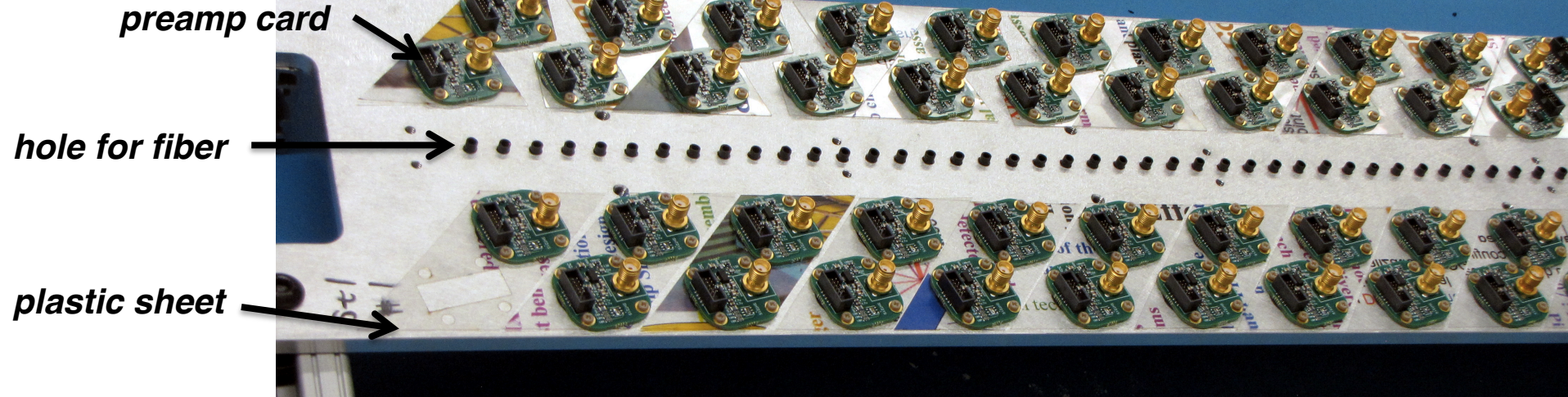


***Box of 80 bars***



# Detector integration (Readout plate)

## Readout plate for 80 bars



SiPM of similar  $V_{op}$  are grouped

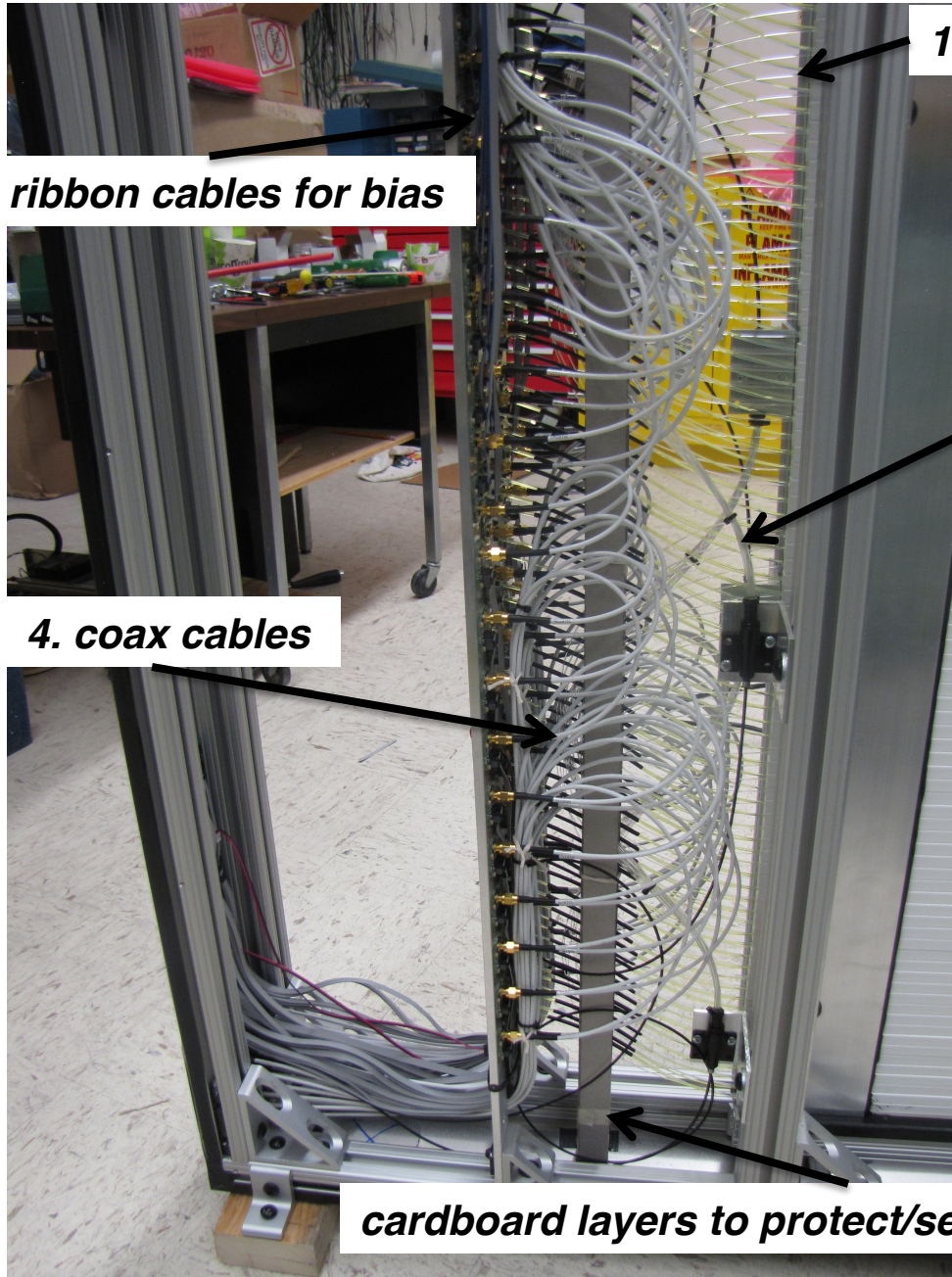




# ***Detector integration (Fiber/cable installation)***



***patch panels***



***2. ribbon cables for bias***

***1. scintillating fibers***

***3. clear fibers for calibration***

***4. coax cables***

***cardboard layers to protect/separate fiber layers***





# Shipping to Fermi lab

- **Arrived in Fermi lab on last Friday (Apr/7<sup>th</sup>)**
  - Plan to test all boxes during safety inspection before installation in E906





***Great efforts from HENP team !!***

